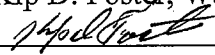


## VPDES PERMIT FACT SHEET

This document gives the pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a major municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 et seq. The discharge results from the operation of an advanced wastewater treatment system with biological nitrogen removal. This permit action consists of revising the Total Kjeldahl Nitrogen effluent limitations, removing the cadmium, chromium VI, cyanide, mercury, nickel, and selenium effluent limitations, revising the storm water outfalls, and revising the special conditions. (SIC Code: 4952)

1. **Facility Name and Address:**  
*Western Virginia Water Authority WPCP*  
1502 Brownlee Avenue, S.E.  
Roanoke, VA 24014  
Location: 1502 Brownlee Avenue, S.E.
2. **Permit No:** VA0025020      Existing Permit Expiration Date: February 20, 2009
3. **Facility/ Owner Contact:**      Mr. Scott Shirley, Wastewater Manager (540) 853-1283
4. **Application Complete Date:**      October 28, 2008 (Revised 11/26/08)  
**Permit Drafted By:**      Becky L. France, Environmental Engineer Senior  
Date: December 23, 2008 (Revised 1/12/09, 2/5/09, 2/12/09, 2/18/09)  
DEQ Regional Office:      Blue Ridge Regional Office, Roanoke Location  
Reviewed By:      Kip D. Foster, Water Permit Manager  
Reviewer's Signature:       Date: 2/18/09  
Public Comment Period Dates: From 1/17/09 To 2/17/09
5. **Receiving Stream Classification:**  
Receiving Stream:      Roanoke River (River Mile: 201.81)  
Watershed ID:      VAW-L04R  
River Basin:      Roanoke River  
River Subbasin:      Roanoke River  
Section:      6  
Class:      IV  
Special Standards:      pH 6.5-9.5  
7-Day, 10-Year Low Flow:      23 MGD      7-Day, 10-Year High Flow:      52 MGD  
1-Day, 10-Year Low Flow:      20 MGD      1-Day, 10-Year High Flow:      44 MGD  
30-Day, 5-Year Low Flow:      35 MGD      Harmonic Mean Flow:      97 MGD  
Tidal:      No      303(d) Listed:      Yes

**Attachment A** contains a copy of the flow frequency determination memorandum.

6. **Operator License Requirements:** Class I

7. **Reliability Class:** I8. **Permit Characterization:**

- ☐ Private      ☐ Interim Limits in Other Document  
☐ Federal      ☐ Possible Interstate Effect  
☐ State  
☒ POTW  
☐ PVOTW

9. **Wastewater Treatment System:** A description of the wastewater treatment system is provided below. See **Attachment B** for the wastewater treatment schematics and **Attachment C** for a copy of the site inspection report. Treatment units associated with the discharge are listed in the table below.

**Table I**  
**DISCHARGE DESCRIPTION**

<b>Outfall Number</b>	<b>Discharge Source</b>	<b>Treatment (Unit by Unit)</b>	<b>Flow (Design) (MGD)</b>
001	Roanoke WWTP (Roanoke City, Roanoke County, Salem City, Botetourt County, Town of Vinton) 37°15'50", 79°54'35"	mechanical bar screens (4) grit chambers (3) primary clarifiers (9) aeration tanks (16) secondary clarifiers (18) rapid mix tanks (2) flocculation tanks (4) sand filters (10) chlorine contact tanks (2) dechlorinator gravity thickeners (2) dissolved air flotation (DAF) thickeners (3) anaerobic digesters (10) sludge lagoons (5)	55 MGD (Expansion to 62 MGD)
003	emergency bypass (equalization basin overflow) 37°15'58", 79°54'32"	sedimentation tank (primary treatment) chlorination	NA
008	storm water from biological aerated filter (BAF) wastewater area, digested sludge area 37°16'00", 79°54'11"	none	NA

Outfall Number	Discharge Source	Treatment (Unit by Unit)	Flow (Design) (MGD)
009	storm water from sodium hypochlorite storage area, digested sludge storage area, motor oil and lubricant storage areas 37°16'00", 79°54'08"	constructed wetland	NA
010	emergency bypass (influent pump station bypass) 37°15'56", 79°54'56"	none	NA
011 (near location of former 007)	storm digested sludge area 37°15'59", 79°54'18"	none	NA

### **Wastewater Treatment Design Capacity Upgrades**

The existing advanced treatment system consists of grit removal, primary clarification, biological activated sludge treatment, biological aerated filters, secondary clarification, chemical coagulation, filtration, disinfection, dechlorination, and post aeration. The biological aerated filters are currently not in operation. Sludge treatment consists of gravity thickening, dissolved air flotation thickening, and anaerobic digestion. In 2008 construction project which consisted of wet weather improvements, process train upgrades, and miscellaneous building construction were completed. Since completion of the wet weather improvements, there have been no wet weather overflow events at the plant. Improvements and/or replacements to all aspects of the primary, secondary, and tertiary treatment system were made. Significant treatment train changes include the following:

- Addition of three new primary clarifiers
- Conversion from two to single stage activated sludge biological system
- Addition of waste activated sludge blend tank
- Addition of two flocculating clarifiers
- Installation of filter bypass line
- Replacement of dual filter media with mono filter media
- Conversion of disinfection system to liquid sodium hypochlorite
- Expansion of equalization basin

A Certificate to Operate the upgraded 55 MGD facility was issued on March 10, 2008. This facility is designed with a peak flow of 79.4 MGD based on limitation in the chlorine contact basin and a maximum peak hydraulic capacity of 137.5 MGD.

The Authority continues to monitor inflow and overflow problems within the distribution system and has ongoing sewer line replacement projects to alleviate sanitary sewer overflows. Capital improvements to upgrade the facility design capacity are planned beginning in 2009. These projects include improvements to the dissolved air flotation (DAF) units, septage grease equipment, and digester and increasing the chlorine contact tank capacity. A summary of capital improvement projects is included in **Attachment C**.

### **Wastewater Treatment Process Description**

**Preliminary Treatment** -- Flow enters the plant through a 66-inch Roanoke Interceptor and a 54-inch Tinker Creek Interceptor. The wastewater is dosed with ferric chloride for chemical phosphorus removal. Preliminary facilities for the wastewater influent consist of four mechanical bar screens and three parallel aerated grit chambers. Solids from the grit chamber are dewatered by inclined rakes and collected for landfill disposal. An 8 million-gallon and 24 million-gallon equalization basin, which function in series, provide surge suppression and flow equalization. Flow to the 24 million-gallon equalization basin is chlorinated when the flow begins to spill over the 8 million-gallon basin. Sludge is generally removed from the equalization basin once a year and routed to a gravity thickener.

**Primary Treatment** -- After passing through aerated grit chambers, the flow is split between nine primary rectangular clarifiers to remove floating settleable solids. Chain and flight-type collector mechanisms convey solids to the sludge hopper for removal. Primary effluent is sent to a single stage activated sludge treatment system.

**Secondary Treatment** -- The wastewater is distributed between 16 parallel activated sludge basins with submerged aeration diffusers. Primary effluent from clarifiers 1 through 3 flows to aeration basins 1 through 6, primary effluent from primary clarifiers 4 through 6 flows to aeration basins 7 through 10, and primary effluent from primary clarifiers 7 through 9 flows to aeration basins 11 through 16. Return sludge is introduced at the head of the basins. From the aeration basins, the wastewater flows into 16 square and 2 circular secondary clarifiers. The sludge return system is operated as a three train system. Return sludge from clarifiers 1 through 6 is pumped separately to aeration basins 1 through 6. Return sludge from clarifiers 7 through 10 is pumped to 1 through 6. Return sludge from clarifiers 11 through 16 is pumped to aeration basins 11 through 16. Return sludge from clarifiers 17 and 18 is pumped to aeration basins 7 through 10.

**Tertiary Treatment** -- Wastewater from the secondary clarifiers flows to the pretreatment system prior to filtration. This tertiary system consists of two rapid mix tanks where ferric chloride is added to precipitate additional phosphorus, four flocculation tanks with vertical mixers, and four square coagulation settling basins. Polymer is added as a pre-filter aid. Sludge is collected through telescoping valves and can be pumped to either the gravity thickeners or dissolved air flotation thickeners (DAFs). Wastewater from the settling basins flows through ten parallel

monomedia filters. Filter backwash is initiated when the filters have 100 hours of operation or the effluent valve opens to 75% to maintain the influent channel water level.

Disinfection/ Post Aeration -- Tertiary effluent is disinfected with liquid hypochlorite in two parallel chlorine contact tanks. Effluent is dechlorinated using liquid sodium bisulfite. The dechlorinated wastewater is aerated by several rows of fine membrane bubble diffusers that are supplied air by three blowers and controlled by the dissolved oxygen concentration in the effluent. Following aeration, the effluent is discharged into the Roanoke River.

### **Bypass Outfalls**

Outfall 003 is the emergency bypass for the equalization basin. Any wastewater discharged from this basin received primary treatment and is chlorinated. Outfall 010 is the emergency bypass from the headworks of the facility, and it is not anticipated that there would be a discharge from this outfall unless the site was flooded.

### **Storm Water Outfalls**

Outfall 002, 005, and 007 were eliminated during recent upgrades at the facility. The drainage area included the old headworks and the employee parking area. All storm water flows to the new headworks. Outfalls 004 and 006 were also eliminated during recent upgrades.

### **Outfall 008**

This outfall drainage area includes the road from the north road along the chemical feed buildings, BAF area, the septic receiving area, and part of the digester area. A portion of the north road has been bermed to contain any spills that may occur during septic unloading.

### **Outfall 009**

The drainage area for this outfall includes the parking area for the main administrative office building and the office building adjacent road. These areas drain to a constructed wetland area. The area also includes the maintenance building area and the area between the biological aerated filters (BAF) and the equalization basins.

### **Outfall 011**

This outfall is located near the former outfall 007. The drainage area for this outfall includes the areas along and including the road adjacent to the digesters, secondary clarifiers, gravity thickeners, primary clarifiers, primary scum building, and west end of the filter building. The area flows into drop inlets to a collection box with an effluent valve.

10. **Sewage Sludge Use or Disposal:** A VPDES Sewage Sludge Permit Application Form was submitted for this facility to address disposal of sewage sludge from the wastewater treatment facility. Sludge is thickened by gravity thickeners, dissolved air flotation (DAF) thickeners, and anaerobic digesters. Thickened sludge is stored in on-site lagoons for land application by a contract operator.

Primary sludge is discharged to two gravity thickeners. Depending on flow, the coagulated sludge from phosphorus removal is routed to either the gravity thickeners or the DAFs.

Secondary effluent is added to maintain aerobic conditions in the thickener. The sludge is allowed to settle and compact, and the thickened sludge is withdrawn from the bottom of the tank. The thickeners remove approximately one half to one fifth of the water. Thickener overflow is returned to the head of the plant.

A portion of the settled secondary sludge from the clarifiers is pumped to two dissolved air flotation (DAF) thickeners. Coagulated sludge may also be discharged to the DAF units. Sludge that rises to the top is skimmed off. Some of the sludge settles to the bottom of the basin and is removed with scraper equipment. The DAF thickeners remove approximately one fifth to one eighth of the water. Supernatant may be used to supply water to the AEP pumps or returned to the head of the plant.

Thickened sludge from the gravity thickeners and the DAF is pumped to seven primary anaerobic digesters. This anaerobic digestion process produces a Class "B" biosolids in accordance with 40 CFR Part 503. The primary digesters reduce the volatile solids. In small batches the contents of the primary digesters are transferred to the three secondary digesters. The sludge in the secondary digesters is allowed to stratify and the clear supernatant is transferred back to the head of the plant. The compacted sludge is discharged to one of five lagoons. The lagoons are decanted as needed to assist in thickening for approximately 9 months. Then, the lagoons are mixed and loaded on trucks and hauled to farmland for land application.

11. **Discharge Location Description:** A USGS topographic map which indicates the discharge location, any significant dischargers, any water intakes, and other items of interest is included in **Attachment D**. The latitude and longitude of outfall 001 are N 37°16'00", E 79°54'39".

Name of Topo: Roanoke Quadrangle Number: 109C

12. **Material Storage:** Chemicals stored at the treatment facility include alum, diesel fuel, ferric chloride, lime, motor oil, polymer, sodium hypochlorite, lime, and sodium metabisulfite. Aboveground storage tanks have secondary containment. Anaerobically digested sludge is stored onsite in five clay-lined lagoons. The permittee's Storm Water Pollution Prevention Plan includes details regarding chemical storage facilities and best management practices to prevent contamination of storm water.
13. **Ambient Water Quality Information:** Stream information which helped to develop permit conditions (special water quality studies and any other biological and/or chemical data, etc.) is listed below.

The Western Virginia Water Authority WPCP discharges to the Roanoke River. The stream is classified as Class IV (Mountainous Zone waters) and has a special standards designation for pH of 6.5 S.U. (minimum) and 9.5 S.U. (maximum). The designation of nutrient enriched (NEW-1) only applies to discharges to Smith Mountain Lake and tributaries to the Roanoke River with Section 6a, and this facility discharge to 6a. The critical low flow values at the discharge point were determined by drainage area proportions using a gauge approximately 2.5 miles upstream of

the discharge point. There has been a slight decrease in flow frequencies since the last reissuance. **Attachment A** contains a copy of the flow frequency determination memorandum.

The permittee also has monitored dissolved oxygen levels in the Roanoke River below the wastewater treatment plant outfall at a location where the dissolved oxygen (DO) concentration reaches the lowest level. For this monitoring study, continuous monitoring began when the river flow was less than or equal to 56 cfs or when the river temperature was equal to or greater than 25 °C. A summary of DO monitoring results in 2008 is found in **Attachment E**.

The Western Virginia Water Authority WPCF discharges into the Roanoke River/Mason Creek Watershed (VAW-L04R) as described in the 2004 Virginia Water Quality Assessment Report (**Attachment F**). This segment of the Roanoke River was listed in the 2008 303(d) Impaired Waters Report due to PCBs in fish tissues, benthic impairment, and exceedances of the bacteria water quality criteria. The EPA approved benthic and bacterial Total Maximum Daily Loads (TMDLs) for this section of the Roanoke River in 2006. See **Attachment G** for wasteload allocations for the approved TMDLs. A PCB TMDL for this segment of the Roanoke River is expected to be completed by the end of 2009.

The Department of Conservation and Recreation's Division of Natural Heritage has designated segments of stream upstream of the discharge location as Stream Conservation Units (SCUs). These SCUs (Roanoke River-North and South Forks) have been given a biodiversity significance ranking of B2, which represents a site of very high significance. The natural heritage resources of concern associated with this SCU include Roanoke logperch and Orange-fin madtom.

The Orange-fin madam is classified as threatened by the Virginia Department of Games and Inland Fisheries (VDGIF) and as a species of concern by the United States Fish and Wildlife Service (USFWS). Also, VDGIF has determined that the state threatened loggerhead shrike is known in the project area.

The Roanoke logperch is classified as endangered by the VGIF and the USFWS. The Roanoke River has been designated by DGIF as a "Threatened and Endangered Species Water". The Roanoke logperch is listed as a federal endangered species and its presence has been documented in the Roanoke River. A copy of the Natural Heritage information and the VDGIF information on species of concern in the area of the discharge is included in **Attachment H**.

From 1994 through 1998, the permittee collected upstream metals data. See **Attachment I** for a summary of these data. Upstream chloride data from STORET Station AROA2020.20 are available from sampling done from 1997 through 1998. The existing conditions in the river below the discharge have not been characterized. The nearest downstream monitoring station is in Smith Mountain Lake which may not be representative of the Roanoke River.

14. **Antidegradation Review and Comments:** Tier I \_\_\_\_\_ Tier II   X   Tier III \_\_\_\_\_

The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier I or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier II water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier II waters is not allowed without an evaluation of the economic and social impacts. Tier III water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with Tier determination. The Roanoke River is not listed as a public water supply in the segment where the discharge is located. Biomonitoring data are available for an upstream monitoring station. Surveys of the benthic organisms performed by the DEQ staff indicate that the river is not fully supporting the aquatic life general standard. As a result of these surveys and E. coli monitoring, the stream segment is listed as impaired on the 303(d) TMDL priority list. The E. coli criteria are not considered for the purposes of designating the antidegradation tier.

The stream segment considered impaired ends at the wastewater treatment discharge, and it is important to note that the monitoring station that was used to classify this stream segment is upstream of the discharge and there is no data available for the Roanoke River which includes the wastewater treatment plant discharge. Because the discharge constitutes a significant portion (> 63%) of the downstream flow, it is reasonable to assume that the characteristics of the stream following discharge may be significantly different from the upstream characteristics.

**Attachment I** contains permittee collected upstream data for eleven dissolved metals. The calculated instream concentrations, with the exception of mercury, meet the acute, chronic, and human health criteria. It was predicted that the chronic and human health criteria for mercury may be violated. However, for two reasons, it is believed that these data may be used to show that the criteria are met, but not to definitively state that they are violated. First, the chronic aquatic life criterion is expressed as methyl mercury whereas the available data are for total dissolved mercury. A fish tissue study would need to be performed to demonstrate that bioaccumulation of methyl mercury is occurring. Second, the available data were not collected using "clean metals" techniques. Because the chronic and human health criteria are extremely low (0.012 µg/L and 0.53 µg/L, respectively), and there is the potential for sample contamination, it is not believed that these data should be used to determine that the receiving stream is not in compliance with the water quality criteria. If there is no solid evidence that the stream with the plant discharge is not in compliance with the water quality standards, the default is to impose high quality water requirements and not allow any significant degradation of this high quality water following any upgrade of the treatment facility. Therefore, this segment of the Roanoke River is classified as a Tier II water, and no significant degradation of existing quality is allowed.



For purposes of aquatic life protection in Tier II waters, “significant degradation” means that no more than 25 percent of the difference between the acute and chronic aquatic criteria values and the existing quality (unused assimilative capacity) may be allocated. For the purposes of the reissuance, the existing water quality refers to the river quality downstream of the plant when the plant had a design flow of 35 MGD. For purposes of human health protection, “significant degradation” means that no more than 10 percent of the difference between the human health criteria and the existing quality (unused assimilative capacity) may be allocated. The antidegradation baselines for aquatic life and human health are calculated for each pollutant as follows:

**Antidegradation baseline (aquatic life) = 0.25 (WQS – existing quality) + existing quality**

**Antidegradation baseline (human health) = 0.10 (WQS – existing quality) + existing quality**

Where:

“WQS” = Numeric criterion listed in 9 VAC 25-260-00 et seq. for the parameter analyzed

“Existing quality” = Concentration of the parameter being analyzed in the receiving stream

The 14 MGD wastewater treatment facility was built in 1952 prior to the antidegradation policy requirements set forth in the Clean Water Act. In 1977, the treatment plant was expanded to 35 MGD. The existing background metals concentrations, discussed above, were based upon the discharge from the 35 MGD facility. The permittee collected upstream data from 1994 through 1999 and these data were entered into the STATS program. The expected values were used as the existing stream concentrations. Effluent data collected at the time of the 35 MGD facility were also used, and these values are found in **Attachment J**. Dissolved metals effluent data and upstream metals data collected at the time of the 35 MGD facility were used to determine instream concentration below the outfall prior to the upgrade to the 42 MGD facility. Where effluent data has not been collected during the period when the facility had a design capacity of 35 MGD facility, the background existing concentrations were based solely on upstream data where available. The resulting values represent the “existing” stream conditions for the purpose of defining the antidegradation baselines. **Attachment K** contains a summary of these “existing” stream concentrations.

When applied, these “antidegradation baselines” become the new water quality criteria in Tier II waters, and effluent limits for future expansions or new facilities must be written to maintain the antidegradation baselines for each pollutant. Stream data and effluent data used to determine 90<sup>th</sup> percentile pH and temperature values for the antidegradation spreadsheet are included in **Attachments E and L**, respectively. Antidegradation baselines have been calculated as described above and included in **Attachments M and N**.

The facility's outfall 001 discharge is existing, and the application indicates an expansion in the discharge of pollutants via this outfall. The antidegradation baselines apply to 55 MGD facility and the expanded facility. The permit limits are in compliance with antidegradation requirements set forth in 9 VAC 25-260-30. The antidegradation review was conducted as described in Guidance Memorandum 00-2011, and complies with the antidegradation policy contained in Virginia's Water Quality Standards.

15. **Site Inspection:** Date: 8/14/08 Performed by: Becky L. France  
**Attachment C** contains a copy of the site inspection memorandum. This year a technical compliance inspection was conducted on June 4, 2008 by Gerald A. Duff. Also, a storm water inspection was conducted by Troy Nipper on July 24, 2008. The last laboratory inspection was conducted on April 30, 2008 by Troy Nipper. Refer to the compliance file for technical compliance and laboratory inspection reports.
16. **Effluent Screening and Limitation Development:** DEQ Guidance Memorandum 00-2011 was used in developing all water quality based limits pursuant to water quality standards (9 VAC 25-260-5 et seq.). Wasteload allocations (WLAs) are calculated for those parameters for which the state of Virginia has established water quality criteria. Refer to **Attachments M** and **N** for the antidegradation wasteload allocation spreadsheet and effluent limit calculations. See **Table II** on pages 35 through 40 for a summary of limits and monitoring requirements.

Since antidegradation applies for the facility from the time it was upgraded from 35 MGD, antidegradation baselines are needed. There was no background data collected at the outfall during the 35 MGD operation at the facility. Therefore, the background concentration at this outfall has been calculated from effluent data for the 35 MGD and upstream STORET data.

The instream concentrations during acute and chronic conditions have been calculated assuming a complete mix as follows:

$$C_s = \frac{(Q_s)(C_{s(0)}) + (Q_e)(C_e)}{Q_s + Q_e}$$

Where:

- $C_s$  = existing acute or chronic concentration
- $Q_s$  = instream critical flow (1Q10 for acute (21.51 MGD) and 7Q10 for chronic prior to expansion (22.99 MGD))
- $C_{s(0)}$  = instream background concentration of pollutant (from STORET data)
- $Q_e$  = design flow of treatment facility prior to expansion (35 MGD)
- $C_e$  = concentration in wastewater discharge (expected value from STATS program)

The acute  $C_s$  was entered is entered into an AWLA spreadsheet as the existing instream concentration to determine the acute AWLA. The chronic  $C_s$  was entered into another AWLA spreadsheet as the existing instream concentration to calculate the chronic AWLA.

Since antidegradation applies, antidegradation baselines are calculated in the spreadsheet to ensure that the increase in the discharge does not result in a significant difference in water quality. An insignificant difference is defined as 25 percent of the difference between the existing condition and the water quality criteria for the aquatic life parameter listed in 9 VAC 250-260-140 using the following equation:

$$C_o = 0.25 (WQC - C_s) + C_s$$

Where :  $C_o$  = baseline acute or chronic concentration criteria  
 WQC = water quality criteria based upon current data for hardness etc.  
 $C_s$  = existing acute or chronic concentration

These calculated baselines ( $C_o$ ) become the new water quality criteria and all antidegradation wasteload allocation are calculated from these baselines instead of the water quality criteria. The AWLA spreadsheet uses the receiving stream data, plant effluent data, and baselines to calculate the AWLAs as follows:

$$AWLA_{(acute\ or\ chronic)} = \frac{C_o [Q_e + (f)(Q_s)] - (C_s)(f)(Q_s)}{Q_e}$$

Where:

AWLA	= antidegradation wasteload allocation
$C_o$	= instream water quality criteria baseline (acute or chronic)
$Q_e$	= current design flow
f	= decimal fraction of critical flow from mixing evaluation (determined from by Agency MIXER program)
$Q_s$	= critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; harmonic mean for carcinogen-human health criteria; and 30Q5 for non-carcinogen human health criteria)
$C_s$	= mean background concentration of parameter in the receiving stream (existing baseline concentration) (calculated for this facility as combination of stream concentration + effluent concentration before upgrade)

#### A. Mixing Zone

The MIXER program was run to determine the percentage of the receiving stream flow to be used when calculating the antidegradation wasteload allocations (AWLAs). The program output indicated that 100 percent of the 7Q10 and 100 percent of 1Q10 may be used for calculating acute and chronic AWLAs for the 55 and 62 MGD facilities. The printouts from the MIXER runs are included in **Attachments M** and **N**.

#### B. Effluent Limitations for Conventional Pollutants (Outfall 001)

**Flow** -- The permitted design flow of 55 MGD for this facility is expressed as a monthly average taken from the application for the reissuance. A design flow of 62 MGD for an expansion has also been included. In accordance with the VPDES Permit Manual, flow is to be measured on a continuous basis with totalizing, indicating, and recording equipment.

The VPDES permit application also included a request that the permit be written for a design tier of 72 MGD. The effects of an expansion to 72 MGD on the loading limits for TKN and BOD<sub>5</sub> have not been addressed in the Water Quality Management Plan for the Roanoke River. Since the Plan does not authorize an increase in loading limits for these

parameters, this flow tier can not be added for the reissuance. Should future modeling data indicate that these loadings can be increased without adversely affecting the water quality of the receiving stream, the Water Quality Management Plan may be modified. The permit could then be modified to incorporate any new loadings given in amendments to the Water Quality Management Plan.

**E. coli** -- The previous permit allowed for a reduced total chlorine residual (0.50 mg/L) after the chlorine contact tanks. Prior to the 1993 reissuance, the permittee had completed studies to show that adequate disinfection was accomplished at this concentration. By letter dated November 3, 1989, the Virginia Department of Health concurred with the conclusions of the study on the condition that should a fecal coliform violation occur, the City must immediately increase the chlorine residual to a minimum of 1.0 mg/L. Therefore, the permittee was required to monitor E. coli concentrations in the discharge daily during the permit term. The monthly average permit limit of 126 N/100 ml for E. coli calculated as a geometric mean has been continued from the previous permit. In accordance with the VPDES Permit Manual, a monitoring frequency will continue to be three days per week between the hours of 10 a.m. and 4 p.m. In the event that chlorine is not used for disinfection, E. coli monitoring shall increase to 1/day. Daily monitoring is needed to ensure compliance with the water quality criteria and the bacteria Total Maximum Daily Load (TMDL).

A bacteria TMDL for the Roanoke River watershed allocates an E. coli wasteload allocation ( $1.08E+14$  cfu/year) that is derived from a bacteria water quality criterion. This allocation was derived by multiplying the design flow (62 MGD) by the bacteria water quality standards (126 cfu/100 mL) for E. coli. The TMDL report indicates that the E. coli limit of 126 cfu/100 mL will ensure compliance with the bacteria TMDL for the discharge. Refer to **Attachment G** for information from the bacteria TMDL report.

**pH** -- The water quality standards allow the pH of the discharge to be between 6.5 and 9.5 S.U. However, the federal technology-based guidelines, 40 CFR Part 133, for secondary treatment require the discharge to be between 6.0 and 9.0 S.U. Therefore, a minimum limit of 6.5 S.U. and a maximum of 9.0 S.U. have been continued from the previous permit. Grab samples shall be collected once per day.

**Biochemical Oxygen Demand (BOD<sub>5</sub>)** -- The limits for BOD<sub>5</sub> are based upon the Upper Roanoke River Subarea Water Quality Management Plan (WQMP) amended in 2003. The Tennessee Valley Authority Flat Water Equation was used in the 1976 Roanoke River Basin WQMP in determining the assimilative capacity and degree of treatment required for the stipulated wasteload allocation for the Roanoke River at the discharge point. This Plan was amended in 1992 and 2007 to reflect current conditions.

**Attachment F** contains an excerpt from these planning bulletins. The amended plan sets the wasteload allocation for BOD<sub>5</sub> at 1173 kg/d for the 62 MGD facility. The increased allocation from 55 MGD to 62 MGD was based upon an evaluation of the plant's effluent BOD<sub>5</sub> concentrations and consideration of new interceptors and other sewer

improvements that eliminate a large portion of the sewer overflows into the river. It was determined that the high degree of tertiary treatment produced an effluent BOD<sub>5</sub> concentration approximately equal to the normal stream background level.

In addition, the BOD<sub>5</sub> was shown to have an extremely slow degrading or non-degrading nature (highly refractory). It is believed that the existing water quality will be maintained for the 55 MGD and 62 MGD facilities due to the effluent's low oxygen demand rate compared to the background BOD. While the allowable effluent loading limitations have been increased, it is believed that the reduction of sewer overflows will result in a net decrease in BOD<sub>5</sub> loadings to the river.

Dissolved oxygen monitoring was completed during 2008. This monitoring indicated some diurnal fluctuations below the water quality criteria, but the average dissolved oxygen over the study period in August through October of 2008 was 7.17 mg/L. For August 2008, the effluent BOD<sub>5</sub> was less than the detection limit of 5.0 mg/L on all but one instance and the effluent DO was above 7.0 mg/L when the instream DO levels fell below the DO minimum criteria.

The monthly average concentration has been changed from 5.0 mg/L to 5 mg/L because Agency guidance recommends only whole numbers for BOD<sub>5</sub>. However, the weekly average concentration limit of 7.5 mg/L will remain the same as the previous permit rather than rounding up because backsliding is prohibited for water quality based limits. The associated loadings have been carried forward for the 55 MGD and 62 MGD facilities. The permitted loadings for the 55 MGD plant are well below the wasteload allocations, and the permitted loading for the 62 MGD plant is equal to the wasteload allocations found in the Water Quality Management Plan. A sample frequency of once per day via 24-hour composite samples has been continued from the previous permit.

**Total Suspended Solids (TSS)** -- The limits for TSS (5.0 mg/L monthly average, 10 mg/L weekly average) are technology-based and are the same as the modified permit. These limits are based on the permittee's tertiary filter study. The plant was evaluated for expansion to 55 MGD, and it was noted that the sand filters would continue to limit peak capacity if they were constructed and operated under the original design. Steps to improve backwashing and upgrade the design to today's standards required removal of the old filter media and replacement with new media. Significant improvement in peak flow capacity through the filters could be gained if the filter media (sand) was converted to a larger size. This change occurred in conjunction with the relaxation of the TSS limit from 2.5 mg/L to 5.0 mg/L because the supplier could no longer guarantee meeting the lower limit. This strategy was a cost-effective way to improve peak capacity yet still produce a high quality effluent. The current concentration limits will remain the same with the associated loadings for the design flows of 55 MGD and 62 MGD. A sample frequency of once per day via 24-hour composite samples has been continued from the previous permit. See **Attachment T** for minutes from the Virginia State Water Control board meetings regarding technology-based total suspended solids limits.

A Total Maximum Daily Load (TMDL) for TSS has been developed for the process water discharge from this facility. The TMDL of 472.2 tons per year can be derived from a monthly average total suspended solids concentration of 5.0 mg/L and a 62 MGD design capacity. Meeting the associated monthly loading limits for total suspended solids will ensure compliance with the TSS TMDL. In accordance with Agency guidance, an annual loading TSS is not needed.

**Total Phosphorus** -- This treatment facility discharges into a segment of the Roanoke River which the water quality standards have not designated as nutrient enriched. However, the Water Quality Management Plan for the Roanoke River specifies that this facility meet a monthly average concentration of 0.20 mg/L to prevent excessive phosphorus loading to Smith Mountain Lake. The concentration limits of 0.20 mg/L monthly average and 0.30 mg/L weekly average have been continued from the previous permit with loadings adjusted based on the design flows of 55 MGD and 62 MGD. A sample frequency of once per day via 24-hour composite samples has been continued from the previous permit.

C. **Effluent Limitation Evaluation for Nonconventional and Toxic Pollutants (Outfall 001)**

In addition to the standard limitations, the discharge must be evaluated to determine whether there is a reasonable potential for the effluent to violate the water quality standards (WQSs) adopted by the State Water Control Board (9 VAC 25-260 et. seq). Toxic pollutant data submitted with the application and required during the permit term were above the quantification levels for ammonia, chloride, chloroform, chromium VI, cyanide, copper, bis (2-ethylhexyl) phthalate, total dissolved solids, E. coli, total residual chlorine (TRC), and zinc. These data are summarized in **Attachment L**.

Since this facility does not discharge into a public water supply, there are no water quality criteria associated with total dissolved solids. So, no further analysis is needed for total dissolved solids.

In accordance with Guidance Memorandum 94-008, it is believed that bis (2-ethylhexyl) phthalate is probably introduced to the sample by plastic/rubber apparatus used in collecting or preparing the sample for analysis. Consequently, it is recommended that analysis results should be disregarded if the substance is found in minute amounts and there is no definable source. Minute amounts are defined as less than 30 µg/L. The data for bis (2-ethylhexyl) phthalate summarized in **Attachment L** was below 30 µg/L. Therefore, the data has been disregarded, and no further evaluation is necessary.

Chloroform has human health criteria based upon fish tissue. In accordance with DEQ Advice Memorandum dated January 10, 2001, human health parameters are assumed to be distributed similarly to other parameters and have the same relative variance (C.V. of about 0.6). The AWLAs were determined using a complete mix assumption as given in the AWLA spreadsheets in **Attachments M** and **N** for the 55 MGD and 62 MGD

facilities. The concentrations given in **Attachment L** were well below the wasteload allocations. Therefore, effluent limitations will not be needed for this parameter.

The acute and chronic water quality criteria and antidegradation wasteload allocations (AWLAs) were determined using a complete mix assumption as given in the spreadsheets in **Attachments M** and **N** for the 55 MGD and 62 MGD facilities. The acute and chronic AWLAs and the effluent data for ammonia, chromium VI, chloride, copper, cyanide, selenium, and zinc were used as input in the Agency's STATS program to determine if limits were necessary for these parameters. STATS program results are discussed below.

**Ammonia as Nitrogen** -- The need for ammonia limits has been reevaluated using revised water quality criteria and low flow stream frequencies. The acute and chronic water quality criteria and antidegradation wasteload allocations (AWLAs) were calculated and are included in the spreadsheets in **Attachments M** and **N**. These antidegradation wasteload allocations include an existing instream background concentration of 0.045 mg/L. This background concentration is the expected value calculated from upstream STORET station 4AROA202.20 collected from 1998 to 2006 (**Attachment I**).

The acute and chronic AWLAs during the high flow months of January through May and the low flow months of June through December were entered into the STATS program to determine if limits are necessary. The 4.0 mg/L monthly TKN limit was used as input into the STATS program. The STATS program output indicated that ammonia as nitrogen limits listed in the tables below are needed. See **Attachments M** and **N** for the STATS program outputs.

**Ammonia (January - May) (STATS output)**

Design Capacity	Monthly Average	Weekly Average
55 MGD	1.5 mg/L	2.1 mg/L
62 MGD	1.4 mg/L	1.9 mg/L

**Ammonia (June - December) (STATS output)**

Design Capacity	Monthly Average	Weekly Average
55 MGD	0.89 mg/L	1.2 mg/L
62 MGD	0.87 mg/L	1.2 mg/L

The facility's existing TKN limits were compared with the ammonia limits needed. Assuming 3.0 mg/L to be refractory organic compounds that will not undergo biological decay (as suggested in the Agency's regional water quality model documentation), the existing TKN limits are protective of the ammonia criteria during part of the year. See **Attachment M** and **N** for tables comparing ammonia limits needed and current TKN limits. Since the permit currently has TKN limits, the TKN limits have been revised to ensure that meeting the TKN limits will ensure compliance with the ammonia criteria.

**Total Kjeldahl Nitrogen (TKN)** -- The TKN limits were developed based on the protection of the dissolved oxygen standard in the stream and the treatment ability of the plant. These limits are part of the revised Roanoke River Water Management Plan and are considered water quality based limits. The previous limits were tiered with a monthly average of 2.0 mg/L and a weekly average of 3.0 mg/L for the months of April through September and a monthly average of 4.0 mg/L and a weekly average of 5.0 mg/L for the months of October through March. These concentration limits have been revised to ensure protection of the ammonia water quality criteria. Three tiered limits with associated loadings have been included for the 55 MGD and 62 MGD facilities. A sample frequency of once per day via 24-hour composite samples has been continued from the previous permit.

**Final TKN Limits (January - March)**

Design Capacity	Monthly Average	Weekly Average
55 MGD	4.0 mg/L (832 kg/d)	5.0 mg/L (1040 kg/d)
62 MGD	4.0 mg/L (939 kg/d)	4.9 mg/L (1150 kg/d)

**Final TKN Limits (April - September)**

Design Capacity	Monthly Average	Weekly Average
55 MGD	2.0 mg/L (416 kg/d)	3.0 mg/L (624 kg/d)
62 MGD	2.0 mg/L (469 kg/d)	3.0 mg/L (704 kg/d)

**Final TKN Limits (October - December)**

Design Capacity	Monthly Average	Weekly Average
55 MGD	3.8 mg/L (790 kg/d)	4.2 mg/L (873 kg/d)
62 MGD	3.7 mg/L (868 kg/d)	4.2 mg/L (986 kg/d)

**Attachment L** contains a compilation of ammonia data collected for the application and TKN monitoring data collected during the permit term. A few of the TKN data points prior to the upgrade to 55 MGD exceeded the TKN concentration limits. TKN data collected since the 55 MGD facility upgrade were below the quantification levels. These 2008 data points were taken during flows well below the current design capacity and do not include many data points for June through December. Therefore, a four-year schedule of compliance has been included to allow the permittee time to meet the most stringent TKN limitations. During the permit term, the permittee has planned capital improvements to upgrade the facility design capacity and optimize nutrient removal. The TKN limitations will be effective four years from the effective date of the permit or upgrade to the 62 MGD, whichever is first. The interim TKN limitations found on page 1 of the permit are continued from the previous permit term and will be effective until compliance with the final TKN limitations is achieved.

**Cadmium, Total Recoverable** -- The previous permit had total recoverable cadmium limitations for the 62 MGD facility (1.1 µg/L monthly average, 1.3 µg/L weekly average). These limits were based upon data collected from 1994 through 1997 when the facility



had a design capacity of 35 MGD. Since 1997, extensive modifications have been made to the facility to upgrade it to 55 MGD. As a result of these upgrades, the effluent data that the limit was based upon are not considered representative of the current operation. Total recoverable cadmium data was collected on June 24, 2008 following the Certificate to Operate the 55 MGD facility, and cadmium was not detected in the effluent. Therefore, a limit is not needed for cadmium.

In accordance with 9 VAC 31-220 L.2.a, backsliding on a limit is allowed when material and substantial alterations or additions to the permitted facility occurred after the permit issuance which justify the application of a less stringent limitation. Additionally, the limitations for the 62 MGD facility may also be removed because the limitations are not yet effective. So, the permit will not contain limitations for cadmium.

While the method detection limit (MDL) was lower than the AWLAs, the practical quantification level (PQL) of 1.0 µg/L was higher than the chronic AWLAs for the 55 MGD and the 62 MGD facility. Therefore, 10 monthly data points of dissolved cadmium data shall be required. These dissolved data shall be collected for the Water Quality Criteria Special Condition (Part I.D.10). Upgrades to the facility are planned in 2009. Based upon the projected completion of these upgrades, the monitoring shall begin in March of 2011.

**Chloride --** Ten chloride data points were submitted for the reissuance application. See **Attachment L** for a summary of these data. The chloride data and the associated acute and chronic AWLAs were entered into the STATS program to determine if limitations are needed for chloride. The program output indicated that chloride limitations are not needed for the 55 or 62 MGD facilities. Since one of the sampled data points exceeded the chloride chronic AWLA, 10 monthly data points will be required beginning March 1, 2011. This chloride monitoring has been included in the Water Quality Criteria Monitoring Special Condition (Part I.D.10).

**Chromium VI, Dissolved --** The previous permit had dissolved hexavalent chromium limitations for the 42, 55, and 62 MGD facilities. These limits were based upon data collected from 1994 through 1997 when the facility had a design capacity of 35 MGD. Since 1997, extensive modifications have been made to the facility to upgrade it to 55 MGD. As a result of these upgrades, the effluent data that the limit was based upon are not considered representative of the current operation. **Attachment L** contains a table of effluent dissolved hexavalent chromium data collected in 2008. These data and the acute and chronic AWLAs were entered into the STATS program to determine if limitations were needed. The STATS output indicates that hexavalent chromium limitations are not needed for the 55 or 62 MGD facilities.

In accordance with 9 VAC 31-220 L.2.a, backsliding on a limit is allowed when material and substantial alterations or additions to the permitted facility occurred after the permit issuance which justify the application of a less stringent limitation. So, the permit will

not contain limitations for hexavalent chromium. See **Attachments M** and **N** for the AWLA spreadsheets and a copy of the STATS program outputs.

**Copper, Dissolved** -- The permittee submitted dissolved copper data during the permit term. Since this data was higher than the AWLAs, a series of 10 composite dissolved copper samples using clean sampling techniques were completed. See **Attachment L** for a table of the clean metals sampling data taken in October and November of 2008. These data points were considerably lower than the previous data point. The data and the associated acute and chronic AWLAs were entered into the STATS program to determine if limitations are needed. The program output indicated that copper limitations are not needed for the 55 or 62 MGD facilities.

Since one of the clean metals sampled data points exceeded the copper chronic AWLA, 10 monthly data points will be required beginning March 1, 2011. The permittee may submit a written waiver request for EPA approval to allow submittal of dissolved metals data for the reissuance application in lieu of total recoverable metals data. This dissolved copper monitoring has been included in the Water Quality Monitoring Special Condition (Part I.D.10). It is recommended that the permittee use clean metals sampling for this monitoring requirement.

**Cyanide, Total** -- The previous permit had total cyanide limitations for the 42, 55, and 62 MGD facilities. These limits were based upon data collected from 1994 through 1997 when the facility had a design capacity of 35 MGD. Since 1997, extensive modifications have been made to the facility to upgrade it to 55 MGD. As a result of these upgrades, the effluent data that the limit was based upon are not considered representative of the current operation. **Attachment L** contains a table of effluent total cyanide data collected in 2008. These data and the acute and chronic AWLAs were entered into the STATS program to determine if limitations were needed. The STATS output indicates that total cyanide limitations are not needed for the 55 or 62 MGD facilities.

In accordance with 9 VAC 31-220 L.2.a, backsliding on a limit is allowed when material and substantial alterations or additions to the permitted facility occurred after the permit issuance which justify the application of a less stringent limitation. So, the permit will not contain limitations for total cyanide. See **Attachments M** and **N** for the AWLA spreadsheets and a copy of the STATS program outputs.

**Dissolved Oxygen (DO)** -- The model used to derive the wasteload allocations for BOD<sub>5</sub> published in the Water Quality Management Plan (WQMP) assumed a minimum effluent DO concentration of 6.0 mg/L. In order to prevent a violation of water quality criteria for DO, this minimum limit was included in the last permit reissuance. This water quality based limit with daily grab sample monitoring has been continued from the previous permit.

The permittee has conducted an instream monitoring study to determine if the BOD<sub>5</sub> and DO limits in the permit are protective of the receiving stream. A summary of the

monitoring results are found in **Attachment E**. The average DO daily concentration from August 7, 2008 to October 15, 2008 was 7.17 mg/L, and the majority of the data for this period was above 4.0 mg/L. There were some periods of DO decline below 4.0 mg/L but these values did not clearly correlate with any decrease in effluent water quality. For August 2008, the effluent BOD<sub>5</sub> was less than the detection limit of 5.0 mg/L on all but one instance and the effluent DO was above 7.0 mg/L when the instream DO levels fell below the DO minimum or DO mean daily criteria. There appeared to be diurnal fluctuations with the lowest DO concentrations during early morning hours. There also may have been a build up of sediment on the sonde membrane which affected dissolved oxygen readings between membrane changes. Further instream dissolved oxygen monitoring is not required for this permit.

**Mercury, Total Recoverable** -- The previous permit had total recoverable mercury limitations for the 42, 55, and 62 MGD facilities. These limits were based upon data collected from 1994 through 1997 when the facility had a design capacity of 35 MGD. Since 1997, extensive modifications have been made to the facility to upgrade it to 55 MGD. As a result of these upgrades, the effluent data that the limit was based upon are not considered representative of the current operation. **Attachment L** contains a table of total recoverable mercury data collected in 2008. All data were less than the quantification level of 0.2 µg/L. This quantification level is lower than the AWLAs. Water quality criteria are as dissolved mercury. Since total recoverable mercury data are below the quantification level, it can be concluded that the dissolved mercury concentrations are also below the quantification level.

In accordance with 9 VAC 31-220 L.2.a, backsliding on a limit is allowed when material and substantial alterations or additions to the permitted facility occurred after the permit issuance which justify the application of a less stringent limitation. So, the permit will not contain limitations for total recoverable mercury.

**Nickel, Total Recoverable** -- The previous permit had total recoverable nickel limitations for the 42, 55, and 62 MGD facilities. These limits were based upon data collected from 1994 through 1997 when the facility had a design capacity of 35 MGD. Since 1997, extensive modifications have been made to the facility to upgrade it to 55 MGD. As a result of these upgrades, the effluent data that the limit was based upon are not considered representative of the current operation. **Attachment L** contains a table of total recoverable nickel data collected in 2008. All data were less than the quantification level of 5.0 µg/L. This quantification level is lower than the AWLAs. Water quality criteria are as dissolved nickel. Since total recoverable nickel data are below the quantification level, it can be concluded that the dissolved nickel concentrations are also below the quantification level. So, limitations for nickel are not needed for the 55 or 62 MGD facilities.

In accordance with 9 VAC 31-220 L.2.a, backsliding on a limit is allowed when material and substantial alterations or additions to the permitted facility occurred after the permit

issuance which justify the application of a less stringent limitation. So, the permit will not contain limitations for total recoverable nickel.

**Selenium, Total Recoverable** -- The previous permit had total recoverable selenium limitations for the 42, 55, and 62 MGD facilities. These limits were based upon data collected from 1994 through 1997 when the facility had a design capacity of 35 MGD. Since 1997, extensive modifications have been made to the facility to upgrade it to 55 MGD. As a result of these upgrades, the effluent data that the limit was based upon are not considered representative of the current operation. **Attachment L** contains a table of total recoverable selenium data collected in 2008. Water quality criteria are as dissolved selenium. But, if the analysis of the total recoverable selenium data indicate that limitations are not needed, it can be concluded that the dissolved selenium concentrations would not result in the need for a limit either. These total recoverable data and the acute and chronic AWLAs were entered into the STATS program to determine if limitations are not needed. The STATS output indicates that total recoverable selenium limitations are not needed for the 55 or 62 MGD facilities.

In accordance with 9 VAC 31-220 L.2.a, backsliding on a limit is allowed when material and substantial alterations or additions to the permitted facility occurred after the permit issuance which justify the application of a less stringent limitation. So, the permit will not contain limitations for total recoverable selenium.

**Temperature** -- The temperature water quality criteria as per 9 VAC 25-260-50 for this Class IV receiving stream is 31 °C. Daily temperature monitoring is being required in the reissued permit. These data will be reported as a maximum daily average for the purposes of calculating the 90<sup>th</sup> percentile effluent temperature values used in the AWLA spreadsheets.

**Total Residual Chlorine (TRC)** -- The total residual chlorine limitation in the previous permit have been reassessed with the revised AWLAs that were determined from the decreased stream flow frequencies. All chlorinated effluent must have a chlorine limit because there is a reasonable potential for the facility to cause or contribute to a violation of criteria. One data value equal to the quantification level (QL) and the antidegradation wasteload allocations were input into the STATS program to generate limits for the 55 and 62 MGD facilities. See **Attachments M** and **N** for the AWLA spreadsheets and STATS program outputs. The permit limits for the 55 MGD have been carried forward from the previous permit. The weekly average for the 62 MGD has been slightly revised. A summary of the limits is given in the table below. A sample frequency of once per day via grab samples has been continued from the previous permit.

Design Capacity	Monthly Average Limit	Weekly Average Limit
55 MGD	0.0028 mg/L	0.0034 mg/L
62 MGD	0.0028 mg/L	0.0033 mg/L

**Whole Effluent Toxicity (WET)** -- For outfall 001, the facility has completed fifteen valid acute and fifteen valid chronic toxicity testing events. For the 55 MGD facility, annual acute toxicity testing using Ceriodaphnia dubia and annual chronic toxicity testing using Pimephales promelas will be required. Upon issuance of a CTO for the expanded facility (62 MGD), quarterly toxicity testing using Ceriodaphnia dubia and Pimephales promelas shall begin.

Monitoring dilution series are established as described in "Toxics Management Program Implementation Guidance," Guidance Memorandum 00-2012, dated August 24, 2000. See **Attachment O** for a compilation of the toxicity testing data and a discussion of the testing results.

**Zinc, Dissolved** -- The permittee submitted dissolved zinc data during the permit term. Since this data was higher than the AWLAs, a series of 10 composite dissolved zinc samples using clean sampling techniques were completed. See **Attachment L** for a table of the clean metals sampling data taken in October and November of 2008. These data points were considerably lower than the previous data point sampling using regular sampling techniques. The clean metals data and the associated acute and chronic AWLAs were entered into the STATS program to determine if limitations are needed for zinc. The program output indicated that zinc limitations are not needed for the 55 or 62 MGD facilities.

D. **Storm Water Outfalls**

Storm water data were submitted for the VPDES permit application. Outfall 007 has been taken out of service and outfall 010 added near the location of the previous outfall. Data submitted with the VPDES Permit Application Form 2F are included in **Attachment P**.

**Outfall 008**

**BOD<sub>5</sub>** -- The BOD<sub>5</sub> grab sample and the COD grab sample collected in August 2008 were higher than the decision criteria. Since the facility's waste stream is primarily municipal rather than industrial BOD<sub>5</sub> rather than COD has been selected for annual monitoring. Grab samples shall be collected.

**Total Suspended Solids** -- Since a TMDL has been developed for total suspended solids, annual total suspended solids via grab samples is required. The TMDL of 34.17 tons per year was based upon a total suspended solids concentration of 100 mg/L. The total suspended solids monitoring data will be measured against the decision criterion of 100 mg/L. If the data exceed the decision criteria, additional best management practices may be needed to reduce the total suspended solids concentration attributed to the facility to below the level of concern.

**Total Kjeldahl Nitrogen** -- The total kjeldahl nitrogen (TKN) grab data collected in August of 2008 was elevated above the decision criterion. Therefore, annual TKN monitoring via grab samples has been included in the permit.

**Flow** -- Flow shall be estimated annual for the storm event sampled in conjunction with annual sampling parameters.

Outfall 009

**Total Suspended Solids** -- Since a TMDL has been developed for total suspended solids, annual total suspended solids via grab samples is required. The TMDL of 34.17 tons per year was based upon a total suspended solids concentration of 100 mg/L. The total suspended solids monitoring data will be measured against the decision criterion of 100 mg/L. If the data exceed the decision criteria, additional best management practices may be needed to reduce the total suspended solids concentration attributed to the facility to below the level of concern.

**Total Kjeldahl Nitrogen** -- The total kjeldahl nitrogen (TKN) grab data collected in August of 2008 were elevated above the decision criterion. Therefore, annual TKN monitoring via grab samples has been included in the permit.

**Flow** -- Flow shall be estimated annual for the storm event sampled in conjunction with annual sampling parameters.

Outfall 011

**Total Suspended Solids** -- Since a TMDL has been developed for total suspended solids, annual total suspended solids via grab samples is required. The TMDL of 34.17 tons per year was based upon a total suspended solids concentration of 100 mg/L. The total suspended solids monitoring data will be measured against the decision criterion of 100 mg/L. If the data exceed the decision criteria, additional best management practices may be needed to reduce the total suspended solids concentration attributed to the facility to below the level of concern.

**Flow** -- Flow shall be estimated annual for the storm event sampled in conjunction with annual sampling for total suspended solids.

17. **Basis for Sludge Use and Disposal Requirements:** Sewage sludge and land application site permit limitations and monitoring are required based on the VPDES Permit Regulation (9 VAC 25-31-10 et seq.) Part VI, Standards for the Use of Disposal of Sewage Sludge, and 40 CFR Part 503. Land application is performed in accordance with the BUR permits issued to Bionomics Incorporated. The BUR permit contains maps showing land application sites in Bedford and Franklin Counties. Sludge characterization data with respect to metals content was submitted with the permit application. A summary of sludge quality for the time period of December 2004

to February 2008 is listed in **Attachment Q**. The sludge is classified as subject to cumulative pollutant loading rates (CPLR). The facility's biosolids meet the following treatment standards:

- The maximum monthly average CPLR concentration requirements in Table 3 of 9 VAC 25-31-540,
- Class B pathogen reduction by anaerobic digestion in accordance with 9 VAC 25-31-710.D.1 and/or fecal coliform density testing in accordance with 9 VAC 25-31-710.B.2
- Vector attraction reduction by reducing the mass of volatile solids in the sewage sludge by a minimum of 38 percent in accordance with 9 VAC 25-31-720.B.1 through B.10
- Alternative methods may be used, but must comply with 9 VAC 25-31-710 (Pathogen Reduction) and 9 VAC 25-31-720 (Vector Attraction Reduction).

Management, recordkeeping, and reporting requirements for sludge subject to CPLR limitations are also included in the permit. The permittee is also required to certify that pathogen reduction, vector attraction reduction, management practices, and site restrictions specified in the permit are being met.

18. **Antibacksliding Statement:** The previous permit had dissolved hexavalent chromium, total cyanide, total recoverable mercury, total recoverable nickel, total recoverable selenium limitations for the 42, 55, and 62 MGD facilities. The previous permit also had total recoverable cadmium limits for the 62 MGD facility. These metals limits have been removed from the permit. These limits were based upon data collected from 1994 through 1997 when the facility had a design capacity of 35 MGD. Since 1997, extensive modifications have been made to the facility to upgrade it to 55 MGD. As a result of these upgrades, the effluent data that the limits were based upon is not considered representative of the current operation.

The evaluation of new data indicates that there is not a potential to exceed the antidegradation wasteload allocations for cadmium, chromium, cyanide, mercury, nickel, and selenium. In accordance with 9 VAC 31-220 L.2.a, backsliding on limits is allowed when material and substantial alterations or additions to the permitted facility occurred after the permit issuance which justify the application of a less stringent limitation. No other limits are less stringent than the previous permit. So, the permit limits comply with the provisions of 9 VAC 25-31-220L of the VPDES Permit Regulation.

19. **Compliance Schedules:** In accordance with 9 VAC 25-31-250, a four year compliance schedule for total kjeldahl nitrogen has been included.
20. **Special Conditions:** A brief rationale for each special condition contained in the permit is given below.

A. **Additional Total Residual Chlorine (TRC) Limitations and Monitoring Requirements (Part I.B)**

Rationale: This condition requires that the permittee monitor the TRC concentration after chlorine contact. In accordance with 40 CFR 122.41 (e), the permittee is required, at all times, to properly maintain all facilities and systems of treatment in order to comply with the permit. These requirements ensure proper operation of chlorination equipment to maintain adequate disinfection.

B. **Schedule of Compliance (Part I.C)**

Rationale: In accordance with 9 VAC 25-31-250 A3, a schedule of compliance has been added to allow the permittee time to meet more stringent TKN limitations.

C. **Compliance Reporting under Part I.A and Part I.B (Part I.D.1)**

Rationale: In accordance with VPDES Permit Regulation, 9 VAC 25-31-190 J4 and 220 I, DEQ is authorized to establish monitoring methods and procedures to compile and analyze data on water quality, as per 40 CFR Part 130, Water Quality Planning and Management, Subpart 130.4. This condition is necessary when toxic pollutants are monitored by the permittee and a maximum level of quantification and/or specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. This condition also establishes protocols for calculation of reported values.

D. **95% Capacity Reopener (Part I.D.2)**

Rationale: This condition requires that the permittee address problems resulting from high influent flows, in a timely fashion, to avoid non-compliance and water quality problems from plant overloading. This requirement is contained in 9 VAC 25-31-200 B2 of the VPDES Permit Regulations.

E. **Indirect Dischargers (Part I.D.3)**

Rationale: This condition is required by VPDES Permit Regulation, 9 VAC 25-31-200 B1 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

F. **CTC, CTO Requirement (Part I.D.4)**

Rationale: This condition is required by Code of Virginia § 62.1-44.19 and the Sewage Collection and Treatment Regulations, 9 VAC 25-790.



**G. Operations and Maintenance Manual Requirement (Part I.D.5)**

Rationale: Submittal of a manual to DEQ for approval is required by Code of Virginia 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790, and VPDES Permit Regulation, 9 VAC 25-31-190 E to provide an opportunity for review of current and proposed operations of the facility.

**H. Licensed Operator Requirement (Part I.D.6)**

Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 D and the Code of Virginia 54.1-2300 et seq., Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 et seq.) require licensure of operators. A Class I operator is required for this facility.

**I. Reliability Class (Part I.D.7)**

Rationale: A Reliability Class I has been assigned to this facility. Reliability class designations are required by Sewage Collection and Treatment Regulations, 9 VAC 25-790-70 for all municipal facilities.

**J. Sludge Reopener (Part I.D.8)**

Rationale: This condition is required by VPDES Permit Regulation, 9 VAC 25-31-220 C4 for all permits issued to treatment works treating domestic sewage.

**K. Sludge Use and Disposal (Part I.D.9)**

Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B2; and 420 and 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal. Technical requirements may be derived from the VPA Permit Regulation, 9 VAC 25-32-10 et seq.

**L. Water Quality Criteria Monitoring (Part I.D.10)**

Rationale: State Water Control Law § 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. States are required to review data on discharges to identify actual or potential toxicity problems, or the attainment of water quality goals, according to 40 CFR Part 131, Water Quality Standards, Subpart 131.11. To ensure that water quality criteria are maintained, the permittee is required to analyze the facility's effluent for the substances noted in Attachment A of this permit.

In accordance with Guidance Memorandum 00-2011, Attachment A water quality standards monitoring should be repeated when there is a new significant industrial user discharging to the POTW or a significant change in the treatment processes at the facility. Capital works projects for 2009 include changes to the sludge handling facilities and chlorine contact which will increase the design capacity of the facility. Additionally, water quality criteria monitoring will be required to complete Form 2A for the VPDES permit reissuance. The Form 2A application does not specify quantification levels needed to provide suitable data for evaluation of the potential to exceed wasteload allocation. Quantification levels are given for this special condition. Ten additional data points will be required for dissolved copper, dissolved cadmium, and chloride. Other parameters shall be monitored once during the permit term.

**M. Reduced Chlorine Level Contingency (Part I.D.11)**

Rationale: A study, approved by the Virginia Department of Health, indicated that adequate disinfection of the effluent was achieved with a chlorine residual of 0.50 mg/L. Should adequate disinfection not be achieved, this special condition will require the permittee to increase the residual to a minimum of 1.0 mg/L.

**N. Total Maximum Daily Load (TMDL) Reopener (Part I.D.12)**

Rationale: Section 303(d) of the Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The reopener recognizes that, according to Section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under Section 303 of the Act.

**O. PCB Monitoring (Part I.D.13)**

Rationale: This special condition shall require the permittee to monitor and report PCB concentrations in dry weather and wet weather effluent samples. The results from this monitoring shall be used to implement the PCB TMDL that is being developed for the Roanoke River. This facility is being given a PCB wasteload allocation in the TMDL.

**P. Lagoon Structural Integrity Study (Part I.D.14)**

Rationale: State Water Control Law Section 62.1-44.21 authorizes the Board to request information needed to determine if there is a significant potential risk to impact State waters. If the results of the structural integrity study indicate the potential for a lagoon failure, a corrective action plan will be required.

**Q. Watertight Integrity Study and Ground Water Risk Assessment (Part I.D.15)**

State Water Control Law Section 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. The Sewage Collection and Treatment Regulations (SCAT (9-VAC 25-790-720.D) specifies permeability requirements for lagoon liners. If the results of the watertight integrity study indicate possible lagoon seepage, a corrective action plan will be required.

**R. Land Application of Sewage Sludge (Part I.E)**

Rationale: Required by the VPDES Permit Regulation Part VI, 9 VAC 25-31-420 through 720, for generators who land apply sewage sludge generated during the treatment of domestic sewage in a treatment works. See **Attachment Q** for sludge monitoring data.

**S. Pretreatment (Part I.F)**

Rationale: This condition is included in accordance with 9 VAC 25-31-220 J of the VPDES Permit Regulation.

**T. Toxics Management Program (Part I.G)**

Rationale: VPDES Permit Regulation, 9 VAC 25-31-210 and 220I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. This requirement is included because the facility has a pretreatment program. See **Attachment O** for the Toxics Management Program Justification Memorandum.

**U. General Storm Water Special Conditions (Part I.H)**

Rationale: This requirement is based upon the VPDES Permit Regulation, 9 VAC 25-31-120B which requires that quantitative data be provided for storm water discharges associated with industrial activity. The VPDES Permit Manual provides the format for Parts I.H.2 through I.H.7 of the permit. Visual quarterly inspections are required for outfalls associated with industrial activity. These requirements are taken from the VPDES general permit for discharges of storm water associated with industrial activity, 9 VAC 25-151-10 et seq. A provision has been included so that the permittee can request approval from DEQ to discontinue quarterly visual inspections for any storm water outfall that does not have a potential for exposure to industrial activity at the site.

**V. Storm Water Pollution Prevention Plan (Part I.I)**

Rationale: VPDES Permit Regulation, 9 VAC 25-31-10 defines discharges of storm water from industrial activity in 9 industrial categories. 9 VAC 25-31-120 requires a permit for these discharges. The Storm Water Pollution Prevention Plan requirements of the permit are derived from the VPDES general permit for discharges of storm water associated with

industrial activity, 9 VAC 25-151-10 et seq. VPDES Permit Regulation, 9 VAC 25-31-220K, requires use of best management practices where applicable to control or abate the discharge of pollutants when numeric effluent limits are infeasible or the practices are necessary to achieve effluent limits or to carry out the purpose and intent of the Clean Water Act and State Water Control Law.

**V. Conditions Applicable to All VPDES Permits (Part II)**

Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

**21. Changes to the Permit:**

**A. Special conditions deleted from the permit are listed below:**

1. The Form 2F Monitoring Special Condition (Part I.C.9) has been deleted because the storm water monitoring required by the previous permit has been submitted.
2. The Bypass Points Special Condition (Part I.C.11) has been removed from the permit. In accordance with the VPDES Permit Manual, these points do not need to be listed and further special language is not needed to address bypasses at the facility because bypasses must be reported in accordance with Part II.U.
3. The Instream Dissolved Oxygen Study Special Condition (Part I.C.12) has been removed because the data required by this study have been collected.

**B. Special conditions that have been modified from the previous permit are listed below: (The referenced permit sections are for the new permit.)**

1. The Additional Total Residual Chlorine (TRC) Limitations and Monitoring Requirements Special Condition (Part I.B) has been revised to include monitoring at the outlet to each chlorine contact basins,
2. A Compliance Reporting under Part I.A and I.B Special Condition (Part I.D.1) has been revised to include information about significant figures.
3. The Operations Manual Special Condition (Part I.D.5) has been revised in accordance with the VPDES Permit Manual.
4. The Water Quality Criteria Monitoring Special Condition (Part I.D.10) has been revised to reflect changes in the Water Quality Standards and the VPDES Permit Manual.

5. The Pretreatment Special Condition (Part I.E) has been revised to note that a certification that no changes are needed to the Significant Industrial User survey may be submitted if applicable.
  6. The Toxics Management Program Special Condition (Part I.F) has been revised for the 55 MGD facility to allow testing of the most sensitive species and reduce the monitoring frequency to annual and add a monitoring schedule with two species for the upgraded facility (62 MGD).
- C. **New special conditions added to the permit are listed below:**
1. A Schedule of Compliance (Part I.C) has been added to allow the permittee time to meet the TKN limitations.
  2. The CTC, CTO Requirement (Part I.D.4) has been added in accordance with the VPDES Permit Manual.
  3. A PCB Monitoring Study Special Condition (Part I.D.13) has been added to provide PCB data to assess compliance with the PCB wasteload allocation being developed for the facility.
  4. Lagoon Structural Integrity Study Special Condition (Part I.D.14) has been added to evaluate the structural integrity of the sludge storage lagoons.
  5. A Watertight Integrity Study and Ground Water Risk Assessment Special Condition (Part I.D.15) has been added to evaluate the integrity of liners for the sludge storage lagoons.
- D. **Permit Limits and Monitoring Requirements:** See Table III on pages 41-44 for details on changes to the effluent limits and monitoring requirements.

22. **Variances/Alternate Limits or Conditions:** An application testing waiver was requested for the requirement to submit quarterly toxicity testing for a 12-month period within the past 1 year using multiple species or the results from four tests performed at least annually in the four and one-half years prior to the application. This waiver request that previous toxicity testing data using one species be accepted in lieu of the application requirement was sent to the EPA, and no comments were received. In accordance with the Memorandum of Understanding, a variance from this testing requirement was granted.

The standard chlorine language has been amended to reflect the current operating procedures at the plant. Specifically, a contact chlorine residual of 0.50 mg/L is required instead of the standard 1.0 mg/L. The permittee submitted a study which was approved by the Department of Health prior to the 1994 reissuance. No other variances or alternatives to required permit conditions or limitations have been included in the permit.

23. **Regulation of Treatment Works Users:** The VPDES Permit Regulation, 9 VAC 25-31-280 B9, requires that every permit issued to a treatment works owned by a person other than a state or municipality provide an explanation of the Board's decision on the regulation of users. The Western Virginia Water Authority owns this treatment works; therefore this regulation does not apply.

24. **Public Notice Information required by 9 VAC 25-31-290 D:**

All pertinent information is on file and may be inspected, and arrangements made for copying by contacting Becky L. France at:

Virginia DEQ, Blue Ridge Regional Office  
3019 Peters Creek Road  
Roanoke, VA 24019  
540-562-6700  
blfrance@deq.virginia.gov

Persons may comment in writing or by e-mail to the DEQ on the proposed permit action and may request a public hearing during the comment period. Comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing, and a brief explanation of how the requester's interests would be directly and adversely affected by the proposed permit action.

Following the comment period, the DEQ will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. See **Attachment R** for a copy of the public notice.

25. **303(d) Listed Segments (TMDL):** This facility discharges directly to the Roanoke River. The stream segment receiving the effluent is listed due to moderate benthic impairment and E. coli in Part I of the 2006 303(d) list. Two Total Maximum Daily Loads (TMDLs) have been developed for the Roanoke River watershed. See **Attachment G** for excerpts from the TMDL reports.

EPA approved the Bacterial TMDLs for Wilson Creek, Ore Branch, and Roanoke River Watersheds, Virginia report on August 2, 2006 for this segment. It contains a wasteload allocation (WLA) for this discharge of 1.08E+14 cfu/year. This permit has a limit of 126 cfu/100 mL (geometric mean for E. coli) that is in compliance with the TMDL. This permit also contains disinfection requirements. Given these limits, this facility can neither cause nor contribute to the observed violation of the standards. The full TMDL report may be found on the web at [www.deq.virginia.gov/tmdl/apptmdls/uroanec.pdf](http://www.deq.virginia.gov/tmdl/apptmdls/uroanec.pdf).

EPA approved the Benthic TMDL Development for the Roanoke River, Virginia report on May 10, 2006 for this segment. It contains a WLA for this discharge of 34.17 tons/year. This WLA allocation is based upon the monthly average loading limits for total suspended solids. By complying with the current total suspended solids loading limits, it is believed the facility will comply with the WLA of the TMDL for this facility. Given the current TSS loading limits, this facility can neither cause nor contribute to the observed violation of the standards. The full TMDL report may be found on the web at [www.deq.virginia.gov/tmdl/apptmdls/uroanbc.pdf](http://www.deq.virginia.gov/tmdl/apptmdls/uroanbc.pdf). A TMDL is currently being developed for PCBs, and a wasteload allocation will be included for this facility. A special condition has been included in the permit to provide PCB data. The permit contains a reopener condition that may allow these limits to be modified, in compliance with section 303(d)(4) of the Act once a TMDL is approved.

26. **Additional Comments:**

- A. **Previous Board Action:** A Special Order by Consent was issued to the City of Roanoke on July 8, 2002, and a copy of this order is in **Attachment C**. This consent order required the City of Roanoke to address inflow and infiltration problems and provide capacity and equalization improvements. The bypass discharge conditions of the consent order expired on February 18, 2004. This consent order was terminated on July 10, 2007.
- B. **Reduced Effluent Monitoring:** In accordance with Guidance Memorandum 98-2005, all permit applications received after May 4, 1998, are considered for reduction in effluent monitoring frequency. Only facilities having exemplary operations that consistently meet permit requirements may qualify for reduced monitoring. To qualify for consideration of reduced monitoring requirements, the facility should not have been issued any Warning Letters, Notices of Unsatisfactory Laboratory Compliance, Letter of Noncompliance (LON) or Notices of Violation (NOV), or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years. Because the facility has been operating under a consent order, reduced monitoring can not be considered.
- C. **Staff Comments:** The discharge is not controversial. The discharge is in conformance with the existing planning document for the area.

The draft permit was revised on January 12, 2009 to change the schedule for PCB monitoring, revise the ammonia compliance date, and provide an alternative E. coli sampling protocol to verify adequate disinfection.

On February 5, 2009 during the public comment period a few changes were made. A special condition was added to require the permittee to test the integrity of the sludge storage lagoons and develop a ground water monitoring program if the liner integrity is not adequate. This special condition was later revised. This special condition was added in response to a DEQ staff inspection in December of 2008 of the sludge lagoons. An e-mail from the permittee on January 4, 2009 provided additional information regarding sludge lagoon number 3. Requirements for procedures for demonstration of the sludge

pathogen requirement and sludge storage have also been added to the O&M Manual special condition.

The proposed ammonia limitations were replaced with more stringent TKN limitations that ensure protection of the ammonia water quality criteria. The alternative disinfection frequency for E. coli was increased from 3 days/week to 1/day to ensure adequate disinfection given the size of the treatment facility and the bacteria TMDL for the receiving stream. Also, the permittee was given the option of testing for E. coli when the chlorine contact TRC residual drops below the minimum limit to demonstrate whether there is adequate disinfection.

On February 12, 2009 and February 18, 2009, in response to permittee comments, the lagoon integrity study special condition requirement (Part I.D.14) was revised and a lagoon structural integrity study special condition (Part I.D.15) added to require the permittee to submit a plans to evaluate the structural integrity and lagoon liner integrity. In the event that the lagoons are not adequate, a corrective action plan will be required.

- D. **Public Comments:** The Virginia Department of Game and Inland Fisheries (VDGIF) and the Department of Recreation's Division of Natural Heritage (DCR) commented on the reissuance application. The VDGIF recommended that the treatment for the discharge be upgraded from chlorine disinfection with dechlorination to ultraviolet disinfection. The facility has dechlorination following chlorination and an E. coli limitation, so an alternative disinfection method was not deemed necessary. They noted karst topography west of the City of Roanoke and requested detailed information regarding any filling or "improvements" to sinkholes or cave openings. They also recommended strict adherence to applicable state and local erosion and sediment control regulations. Any instream work plans would need to be reviewed and approved by DEQ's Virginia Water Protection Program, and adequate erosion and sediment control would be required.

The Virginia Associate of Municipal Wastewater Agencies submitted public comments. A copy of these comments and the response letter is included in **Attachment R**.

E. **Tables:**

Table I	Discharge Description (Pages 2-3)
Table II	Basis for Monitoring Requirements (Pages 35-40)
Table III	Permit Processing Change Sheets (Pages 41-44)

F. **Attachments:**

- A. Flow Frequency Memorandum
- B. Wastewater Schematics and Outfall Location Maps
- C. Facility Information
  - Site Inspection Reports
  - Industrial Wastewater Contributors



- Special Order by Consent
- CTO Approval Letter (55 MGD Facility)
- D. USGS Topographic Map
- E. Ambient Water Quality Data
  - Upstream pH and Temperature Monitoring Data
  - Upstream Hardness Data
  - Instream Dissolved Oxygen Monitoring Summary
- F. Ambient Water Quality Planning Evaluations
  - 2006 Impaired Water Report (Excerpt)
  - Virginia Water Quality Assessment 305(b)/303(d) Integrated Report, August 2004 (Excerpt)
  - 1992 Upper Roanoke River Subarea Water Quality Management Plan (Excerpt)
  - 2007 Water Quality Management Planning Regulation -- Roanoke River Basin (9 VAC 25-720-80) (Excerpt)
- G. Roanoke River TMDLs
  - Benthic TMDL Development for the Roanoke River, March 2006 (Excerpt)
  - Bacteria TMDLs for Wilson Creek, Ore Branch, and Roanoke River Watersheds, Virginia, February 2006 (Excerpt)
- H. Endangered Species Information
- I. Instream Water Quality Data for Existing Baseline Antidegradation Calculations
  - Upstream Roanoke River Dissolved Metals Data Summary (1994-1998)
  - Upstream Chloride Data (1996-2001) (AROA202.20)
  - Upstream Water Quality Lab Data Reports
- J. Effluent Water Quality Data for Existing Baseline Antidegradation Calculations
  - Effluent Dissolved Metals Data Summary (1994-1997)
  - Effluent Chloride Data Summary (1997-1998)
  - Effluent Water Quality Lab Data Reports
- K. Existing Instream Conditions Determinations
  - Instream Expected Value Determinations (STATS Program)
  - Effluent Expected Value Determinations (STATS Program)
  - Background Roanoke River Water Quality Calculations (Prior to 55 MGD Facility Upgrade)
- L. Effluent Data
  - Phosphorus and BOD<sub>5</sub> Data
  - TKN Data
  - Hardness Data
  - pH Data
  - Temperature Data
  - PCB Data
  - Summary of Quantifiable Effluent Data
  - Water Quality Standards Monitoring Lab Data Sheets
- M. Wasteload and Limit Calculations – 55 MGD
  - Mixing Zone Output (MIXER 2.1)
  - Summary of 90<sup>th</sup> Percentile and Mean Values

- Antidegradation Wasteload Allocation Spreadsheets
  - Summary of Ammonia, Chloride, Metals, and TRC AWLAs
  - Comparison of Existing TKN and Proposed Ammonia Limits
  - STATS Program Results (ammonia, chloride, Cr VI, CN, Cu, Se, TRC, Zn)
- N. Wasteload and Limit Calculations – 62 MGD
- Mixing Zone Output (MIXER 2.1)
  - Summary of 90th Percentile and Mean Values
  - Antidegradation Wasteload Allocation Spreadsheets
  - Summary of Ammonia, Chloride, Metals, and TRC AWLAs
  - Comparison of Existing TKN and Proposed Ammonia Limits
  - STATS Program Results (ammonia, chloride, Cr VI, Cu, CN, Se, TRC, Zn)
- O. Toxicity Management Plan (TMP)
- TMP Justification Memorandum
  - Acute/ Chronic Toxicity Endpoint Spreadsheets (55, 62 MGD)
- P. Storm Water Data
- Storm Water Data (Outfalls 007, 008, 009)
  - Storm Water Lab Summary Data Sheets
- Q. Sewage Sludge
- Sludge Data
  - Sludge Received from Offsite
- R. Public Notice/ Public Notice Comments
- S. EPA Checksheet
- T. Virginia State Water Control Board Minutes

Table II-1  
BASIS FOR LIMITATIONS -- MUNICIPAL

( ) Interim Limitations  
(x) Final Limitations

OUTFALL: 001      Effective Dates - From: Effective Date  
DESIGN CAPACITY: 55 MGD      To: Expiration Date or Upgrade to 62 MGD  
Facility

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS			MONITORING REQUIRED		
		MONTHLY AVERAGE	WEEKLY AVERAGE	MINIMUM	MAXIMUM	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH (SU)	1,2	NA	NA	6.5	9.0	1/Day	Grab
BOD <sub>5</sub>	4	5 mg/L 1040 kg/d	7.5 mg/L 1561 kg/d	NA	NA	1/Day	24HC
Total Suspended Solids	3	5.0 mg/L 1040 kg/d	10 mg/L 2081 kg/d	NA	NA	1/Day	24 HC
Chlorine, Total Residual	2	0.0028 mg/L	0.0034 mg/L	NA	NA	1/Day	Grab
Dissolved Oxygen	2,4	NA	NA	6.0 mg/L	NA	1/Day	Grab
Phosphorus, Total	4	0.20 mg/L 41 kg/d	0.30 mg/L 62 kg/d	NA	NA	1/Day	24 HC
Temperature	2	NA	NA	NA	NL °C	1/Day	IS
E. coli (N/100 ml)	2	126*	NA	NA	NA	3 Days/Week	Grab
Total Kjeldahl Nitrogen (Jan. – Mar.)	2,4	4.0 mg/L 832 kg/d	5.0 mg/L 1040 kg/d	NA	NA	1/Day	24 HC
Total Kjeldahl Nitrogen (April – Sept.)	2,4	2.0 mg/L 416 kg/d	3.0 mg/L 624 kg/d	NA	NA	1/Day	24 HC
Total Kjeldahl Nitrogen (Oct. -Dec.)	2,4	3.8 mg/L 790 kg/d	4.2 mg/L 873 kg/d	NA	NA	1/Day	24 HC

NA = Not Applicable    NL= No Limitations; monitoring only    24 HC= 24 hour composite sample    IS = immersion stabilization    \*geometric mean    TIRE= totalizing, indicating, recording equipment

The basis for the limitations codes are:

1. Federal Technology-Based Secondary Treatment Regulation (40 CFR Part 133)
2. Water Quality Criteria
3. Best Professional Judgement
4. Other - Upper Roanoke River Subarea Water Quality Management Plan

Table II-2  
BASIS FOR LIMITATIONS – MUNICIPAL

(X) Interim Limitations  
( ) Final Limitations

OUTFALL: 001 Effective Dates - From: Effective Date  
DESIGN CAPACITY: 55 MGD To: Expiration Date or Upgrade to 62 MGD Facility

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS			MONITORING REQUIRED		
		MONTHLY AVERAGE	WEEKLY AVERAGE	MINIMUM	MAXIMUM	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH (SU)	1,2	NA	NA	6.5	9.0	1/Day	Grab
BOD <sub>5</sub>	4	5 mg/L 1040 kg/d	7.5 mg/L 1561 kg/d	NA	NA	1/Day	24HC
Total Suspended Solids	3	5.0 mg/L 1040 kg/d	10 mg/L 2081 kg/d	NA	NA	1/Day	24 HC
Chlorine, Total Residual	2	0.0028 mg/L	0.0034 mg/L	NA	NA	1/Day	Grab
Dissolved Oxygen	2,4	NA	NA	6.0 mg/L	NA	1/Day	Grab
Phosphorus, Total	4	0.20 mg/L 41 kg/d	0.30 mg/L 62 kg/d	NA	NA	1/Day	24 HC
Temperature	2	NA	NA	NA	NL °C	1/Day	IS
E. coli (N/100 ml)	2	126*	NA	NA	NA	3 Days/Week	Grab
Total Kjeldahl Nitrogen (April – Sept.)	2,4	2.0 mg/L 416 kg/d	3.0 mg/L 624 kg/d	NA	NA	1/Day	24 HC
Total Kjeldahl Nitrogen (Oct. – March)	2,4	4.0 mg/L 832 kg/d	5.0 mg/L 1040 kg/Ld	NA	NA	1/Day	24 HC

NA = Not Applicable NL= No Limitations; monitoring only 24 HC= 24 hour composite sample IS = immersion stabilization \*geometric mean TIRE= totalizing, indicating, recording equipment

The basis for the limitations codes are:

1. Federal Technology-Based Secondary Treatment Regulation (40 CFR Part 133)
2. Water Quality Criteria
3. Best Professional Judgment
4. Other – Upper Roanoke River Subarea Water Quality Management Plan

**Table II-3**  
**BASIS FOR LIMITATIONS – MUNICIPAL**

( ) Interim Limitations  
(x) Final Limitations

Effective Dates - From: Upgrade to 62 MGD Facility  
To: Expiration Date

OUTFALL: 001  
DESIGN CAPACITY: 62 MGD

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS			MONITORING REQUIRED		
		MONTHLY AVERAGE	WEEKLY AVERAGE	MINIMUM	MAXIMUM	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	Continuous	TIRE
pH (SU)	1,2	NA	NA	6.5	9.0	1/Day	Grab
BOD <sub>5</sub>	4	5 mg/L 1173 kg/d	7.5 mg/L 1760 kg/d	NA	NA	1/Day	24HC
Total Suspended Solids	3	5.0 mg/L 1173 kg/d	10 mg/L 2346 kg/d	NA	NA	1/Day	24 HC
Chlorine, Total Residual	2	0.0028 mg/L	0.0033 mg/L	NA	NA	1/Day	Grab
Dissolved Oxygen	2,4	NA	NA	6.0 mg/L	NA	1/Day	Grab
Total Phosphorus	4	0.20 mg/L 47 kg/d	0.30 mg/L 70 kg/d	NA	NA	1/Day	24 HC
Temperature	2	NA	NA	NA	NL °C	1/Day	IS
<i>E. coli</i> (N/100 ml)	2	126*	NA	NA	NA	3 Days/Week	Grab
Total Kjeldahl Nitrogen (Jan. – Mar.)	2,4	4.0 mg/L 939 kg/d	4.9 mg/L 1150 kg/d	NA	NA	1/Day	24 HC
Total Kjeldahl Nitrogen (Apr. – Sep.)	2,4	2.0 mg/L 469 kg/d	3.0 mg/L 704 kg/d	NA	NA	1/Day	24 HC
Total Kjeldahl Nitrogen (Oct. – Dec.)	2,4	3.7 mg/L 868 kg/d	4.2 mg/L 986 kg/d	NA	NA	1/Day	24 HC

NA = Not Applicable NL= No Limitations; monitoring only 24 HC= 24 hour composite sample IS = immersion stabilization \*geometric mean TIRE= totalizing, indicating, recording equipment

The basis for the limitations codes are:

1. Federal Technology-Based Secondary Treatment Regulation (40 CFR Part 133)
2. Water Quality Criteria
3. Best Professional Judgment
4. Other – Upper Roanoke River Subarea Water Quality Management Plan

**Table II-4**  
**BASIS FOR LIMITATIONS – MUNICIPAL**

( ) Interim Limitations  
(x) Final Limitations

Effective Dates - From: Effective Date  
To: Expiration Date

OUTFALL: 008

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS			MONITORING REQUIRED		
		MONTHLY AVERAGE	WEEKLY AVERAGE	MINIMUM	MAXIMUM	Frequency	Sample Type
BOD <sub>5</sub>	6	NA	NA	NA	NL mg/L	1/Year	Grab
Total Suspended Solids	5	NA	NA	NA	NL mg/L	1/Year	Grab
Total Kjeldahl Nitrogen	6	NA	NA	NA	NL mg/L	1/Year	Grab
Flow (MG)	NA	NA	NA	NA	NL	1/Year	Estimate

NA = Not Applicable NL= No Limitations; monitoring only

The basis for the limitations codes are:

1. Federal Technology-Based Secondary Treatment Regulation (40 CFR Part 133)
2. Water Quality Criteria
3. Best Professional Judgment
3. Other -- Upper Roanoke River Subarea Water Quality Management Plan
4. Bacterial Total Maximum Daily Load (TMDL) for Roanoke River
5. Benthic TMDL for Roanoke River
6. Above Storm Water Decision Criteria

**Table II-5**  
**BASIS FOR LIMITATIONS – MUNICIPAL**

( ) Interim Limitations  
(x) Final Limitations

OUTFALL: 009  
Effective Dates - From: Effective Date  
To: Expiration Date

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS			MONITORING REQUIRED		
		MONTHLY AVERAGE	WEEKLY AVERAGE	MINIMUM	MAXIMUM	Frequency	Sample Type
Total Suspended Solids	5	NA	NA	NA	NL mg/L	1/Year	Grab
Total Kjeldahl Nitrogen	6	NA	NA	NA	NL mg/L	1/Year	Grab
Flow (MG)	NA	NA	NA	NA	NL	1/Year	Estimate

NA = Not Applicable NL= No Limitations; monitoring only

The basis for the limitations codes are:

1. Federal Technology-Based Secondary Treatment Regulation (40 CFR Part 133)
2. Water Quality Criteria
3. Best Professional Judgment
3. Other – Upper Roanoke River Subarea Water Quality Management Plan
4. Bacterial Total Maximum Daily Load (TMDL) for Roanoke River
5. Benthic TMDL
6. Above Storm Water Decision Criteria

**Table II-6**  
**BASIS FOR LIMITATIONS – MUNICIPAL**

( ) Interim Limitations  
(x ) Final Limitations

OUTFALL: 011

Effective Dates - From: Effective Date  
To: Expiration Date

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS			MONITORING REQUIRED		
		MONTHLY AVERAGE	WEEKLY AVERAGE	MINIMUM	MAXIMUM	Frequency	Sample Type
Total Suspended Solids	5	NA	NA	NA	NL mg/L	1/Year	Grab
Flow (MG)	NA	NA	NA	NA	NL	1/Year	Estimate

NA = Not Applicable NL= No Limitations; monitoring only

The basis for the limitations codes are:

1. Federal Technology-Based Secondary Treatment Regulation (40 CFR Part 133)
2. Water Quality Criteria
3. Best Professional Judgment

3. Other – Upper Roanoke River Subarea Water Quality Management Plan
4. Bacterial Total Maximum Daily Load (TMDL) for Roanoke River
5. Benthic TMDL
6. Above Storm Water Decision Criteria



**Table III**  
**PERMIT PROCESSING CHANGE SHEET**

**LIMITS AND MONITORING SCHEDULE:**

Outfall No.	Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
		From	To	From	To		
001 (55 MGD)	BOD <sub>5</sub>			5.0 mg/L (1040 kg/d) monthly average; 7.5 mg/L (1561 kg/d) weekly average	5 mg/L (1040 kg/d) monthly average; 7.5 mg/L (1561 kg/d) weekly average	The monthly average changed to whole number as per Agency guidance. The weekly average did not change to avoid backsliding on the limit.	2/5/09
001 (55 MGD)	Cyanide, Total	2 Days/Month	NA	7.4 µg/L monthly average; 9.1 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (55, 62 MGD)	Temperature	NA	1/Day	NA	NL °C	Temperature monitoring required to provide information used to determine antidegradation wasteload allocations.	11/20/08
001 (55 MGD)	TKN (Oct - Dec.)			4.0 mg/L (832 kg/d) monthly average; 5.0 mg/L (1040 kg/d) weekly average	3.8 mg/L (790 kg/d) monthly average; 4.2 mg/L (873 kg/d) weekly average	STATS program indicated ammonia limits needed. Program output limits more stringent than TKN limits for October through December. So, TKN limits have been made more stringent so that meeting these limits will be protective of ammonia criteria. For the purposes of comparing the stringency of TKN and ammonia limits, TKN is assumed to consist of ammonia and 3.0 mg/L of refractory nitrogen.	2/5/09
001 (55 MGD)	Nickel, Total Recoverable	2/Month	NA	28 µg/L monthly average; 35 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (55 MGD)	Chromium, Hexavalent, Dissolved	2/Month	NA	7.1 µg/L monthly average; 8.7 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08

**Table III**  
**PERMIT PROCESSING CHANGE SHEET**

**LIMITS AND MONITORING SCHEDULE:**

Outfall No.	Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
		From	To	From	To		
001 (55 MGD)	Mercury, Total Recoverable	2/Month	NA	0.014 µg/L monthly average; 0.018 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (55 MGD)	Selenium, Total Recoverable	2/Month	NA	4.6 µg/L monthly average; 5.6 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (62 MGD)	BOD <sub>5</sub>			5.0 mg/L (1173 kg/d) monthly average; 7.5 mg/L (2346 kg/d) weekly average	5 mg/L (1173 kg/d) monthly average; 7.5 mg/L (2346 kg/d) weekly average	The monthly average changed to whole number as per Agency guidance. The weekly average did not change to avoid backsliding on the limit.	2/5/09
001 (62 MGD)	Chlorine, Total Residual		0.0028 mg/L monthly average; 0.0034 mg/L weekly average	0.0031 mg/L monthly average; 0.0039 mg/L weekly average	0.0028 mg/L monthly average; 0.0034 mg/L weekly average	STATS program indicated more stringent limits needed.	11/20/08
001 (62 MGD)	Cyanide, Total	2/Month	NA	7.2 µg/L monthly average; 8.8 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08

**Table III**  
**PERMIT PROCESSING CHANGE SHEET**

**LIMITS AND MONITORING SCHEDULE:**

Outfall No.	Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
		From	To	From	To		
001 (62 MGD)	Nickel, Total Recoverable	2/Month	NA	26 µg/L monthly average; 32 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (62 MGD)	Cadmium, Total Recoverable	2/Month	See Part I.D.10 (1/mont h for 12 months)	1.1 µg/L monthly average; 1.3 µg/L weekly average	NL µg/L	Facility upgrade to 55 MGD represents material and substantial alterations in the treatment plant. New data entered into STATS program indicated a limit is not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (62 MGD)	Chromium, Hexavalent, Dissolved	2/Month	NA	6.9 µg/L monthly average; 8.5 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in treatment plant. New data entered into STATS program indicated limit not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (62 MGD)	Selenium, Total Recoverable	2/Month	NA	4.5 µg/L monthly average; 5.5 µg/L weekly average	NA	Facility upgrade to 55 MGD represents material and substantial alterations in treatment plant. New data entered into STATS program indicated limit not needed. Backsliding exemption applies due to facility alterations.	11/20/08
001 (62 MGD)	TKN (Oct - Dec.)			4.0 mg/L (939 kg/d) monthly average; 5.0 mg/L (1173 kg/d) weekly average	3.7 mg/L (868 kg/d) monthly average; 4.2 mg/L (986 kg/d) weekly average	STATS program indicated ammonia limits needed. Program output limits more stringent than TKN limits for October through December. So, TKN limits have been made more stringent so that meeting these limits will be protective of the ammonia water quality criteria. For the purposes of comparing the stringency of TKN and ammonia limits, TKN is assumed to consist of ammonia and 3.0 mg/L of refractory nitrogen.	1/26/09

**Table III**  
**PERMIT PROCESSING CHANGE SHEET**

**LIMITS AND MONITORING SCHEDULE:**

Outfall No.	Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason for Change	Date
		From	To	From	To		
001 (62 MGD)	TKN (Jan. - Mar.)			4.0 mg/L (939 kg/d) monthly average; 5.0 mg/L (1173 kg/d) weekly average	4.0 mg/L (939 kg/d) monthly average; 4.9 mg/L (1150 kg/d) weekly average	STATS program indicated ammonia limits needed for weekly average. Program output limits more stringent than TKN limits for October through December. So, TKN limits have been made more stringent so that meeting these limits will be protective of the ammonia water quality criteria. For the purposes of comparing the stringency of TKN and ammonia limits, TKN is assumed to consist of ammonia and 3.0 mg/L of refractory nitrogen.	2/5/09
008	BOD <sub>5</sub>	NA	1/Year	NA	NL mg/L maximum	Monitoring added because monitoring data above decision criteria.	11/20/08
008	Total Suspended Solids	NA	1/Year	NA	NL mg/L maximum	Monitoring added to determine if decision criteria met for discharge into water quality segment that is impaired due to sediment.	11/20/08
008	Total Kjeldahl Nitrogen	NA	1/Year	NA	NL mg/L maximum	Monitoring added because monitoring data above decision criteria.	11/20/08
008	Flow	NA	1/Year	NA	NL MG	Monitoring required in conjunction with other parameters for storm event.	11/20/08
009	Total Suspended Solids	NA	1/Year	NA	NL mg/L maximum	Monitoring added to determine if decision criteria met for discharge into water quality segment that is impaired due to sediment.	11/20/08
009	Total Kjeldahl Nitrogen	NA	1/Year	NA	NL mg/L maximum	Monitoring added because monitoring data above decision criteria.	11/20/08
009	Flow	NA	1/Year	NA	NL MG	Monitoring required in conjunction with other parameters for storm event.	11/20/08
011	Total Suspended Solids	NA	1/Year	NA	NL mg/L maximum	Monitoring added to determine if decision criteria met for discharge into water quality segment that is impaired due to sediment.	11/20/08
011	Flow	NA	1/Year	NA	NL MG	Monitoring required in conjunction with other parameters for storm event.	11/20/08